SIMULATION AND OPTIMIZATION OF SILICON SOLAR CELL USING MgF_2/SiO_2 DOUBLE - LAYER ANTI – REFLECTIVE COATING (ARC)

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AUTHORS' DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Silicon is harmless and abundant in the earth's crust, moreover silicon photovoltaic modules have demonstrated long-term stability in practice over decades. Conducted power supply of electricity based on one of the most common methods of harnessing solar energy is photovoltaic. With the revolution of new energy innovation explosive growth in recent years, generated electricity technology varies based on photovoltaic has possessed great progress but at a considerable expensed was one of the primary issues of this field. As a result, in order to drive into a better manufacturing technology, the effectiveness of the cells and modules is the primary lever actually for further cost reduction. The purpose of this research is to study about the parameter on crystalline silicon solar cell with double layer of MgF_2/SiO_2 as its anti-reflective coating (ARC) which is the thickness. An antireflection coating mostly introduced in solar cell in order to reduce the reflection of light from the front surface of the cell. The research in this work concentrated on using simulation Wafer Ray Tracer of PV Lighthouse in order to measure the parameter for ARC. For type of the ARC, more focused on planar surface with constant thickness on the bottom layer (MgF_2) which is 50 nm meanwhile for the top layer (SiO_2) changed with its refractive index. From MgF_2/SiO_2 adjusted thickness, gave Jmax for each four schemes until they reach their maximum. At the end of this study, the J_{max} enhancement percentage measured should be increased from time to time alongside with the J_{max}. From the observation, the final result that had been obtained is absorption of light surpass great curves during MgF_2 = 50 nm, SiO_2 = 50 nm. The highest value of J_{max} and its enhancement gained are 32.13 and 28.89%, respectively. Therefore, it is important to achieve optimum value in absorption hence literally shown the MgF_2/SiO_2 bilayer coatings can give excellent optical property.